Tropical Analysis on the Architecture of Churches: The Effects of Climatic Factors to the Climatic Responsiveness of Our Lady of Mount Carmel Parish Church in Malilipot, Albay

Tropical Design 1
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I. Introduction

Churches are one of the quintessential structures carrying out significant contribution on different styles, characters, and construction methods throughout history up to the present. These architectural elements and features do not only tell a story about the past, but also impose logical placement, planning, and designing of its parts bounded by existing environmental factors where the site of the church lies.

According to the 5th edition of Sir Banister F. Fletcher's "A History of Architecture on the Comparative Manner", each architectural style has been developed through influences such as:

1. Geography – position on the globe; territorial influences and from its neighboring settlements; trading, and; transportation.
2. Geology – physical topography of the site; abundance of raw materials used in construction.
3. Climate – long-term weather conditions on particular region or area; seasons, and; climate change.
4. Religion – beliefs; traditions; and particular group of people with shared culture and norms influencing architectural character of a particular style.
5. Social and Political – significant personas; icons that helped the architectural style emerge and integrate throughout history.
6. History – significant events that root to certain movement in art and architecture sometimes leading to style transitions and adaptations.

In this narrative, the researcher will focus on the third factor that influence a certain architectural style as part of the primary aspects to be considered to develop a tropical analysis. (Fletcher, 1905 pp.11–12)

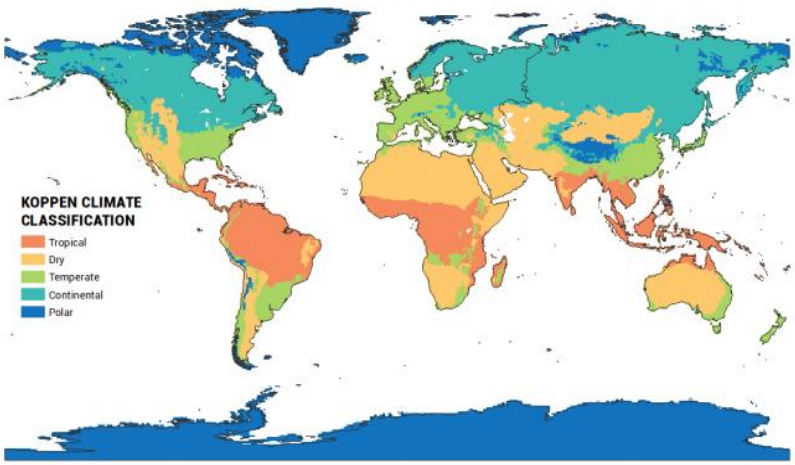


Figure 1: Köppen Geiger Climate Classification System; retrieved, 23 September 2025 from https://earthhow.com/koppen-climate-classification/

"Tropical Design" is an architectural course that aims to understand the impact of climate in designing a building or dwelling particular on countries experiencing tropical climate. (Holder, 2023) Climatic responsive design refers to the architectural approach applied in a design of a building that adapts its local climate primarily to achieve a sustainable lifestyle inside a building. This refers to the significant considerations of the following: (1) passive cooling techniques; (2)

natural light and ventilation; and (3) integration of local materials into resilient and practical utilization. (Fiveable, 2024)

The Philippines (Manila at 14.6° N, 121.0° E), as one of the countries under “Tropical Zone” or Group A according to Köppen Geiger Climate Classification System (see Figure 1) is one apparent significance of studying Tropical Design thus developing a tropical analysis on structures present in the area. Tropical regions experience constant warm climate (~18°C), high precipitation (150 cm) annually, and has only two seasons: the dry and wet seasons. (Earth How, 2023) (Ona, 2025)

Figure 2: Façade, Our Lady of Mount Carmel Parish; taken, 22 September 2013; retrieved, 23 September 2025 from *https://lasagradaexpedicion.weebly.com/la-sagrada-expedicioacuten/bicol-visita-iglesia*

Figure 3: Façade, Our Lady of Mount Carmel Parish; taken by the researcher, 23 September 2025.

The chosen building: Our Lady of Mount Carmel Parish (Local Name: Nuestra Señora Del Carmen), situated along Del Carmen Street, Barangay II (Poblacion), Malilipot, Albay is a parish church owned by the Vicariate of St. Rose of Lima of the Diocese of Legazpi. Groundbreaking in 1789, completed in 1877. Dedicated to the patron saint of sailors and fishermen, Our Lady of Mount Carmel whose feast day is on July 16. The façade is made of volcanic stone bricks coming from the Mayon Volcano. The church embodies a Spanish colonial style introduced to Albay during the Spanish conquest in the province. The three columns of the church portal and the façade symmetry are the apparent characteristics of the style. Other features include the baptistery and window grills which are preserved since the groundbreaking. (Silver Backpacker, 2022)

Figure 2 shows a picture of the church façade in 2013, whereas Figure 3 shows a picture of the church originally taken by the researcher to compare and contrast the past and present developments at the site.

In terms of the considerations behind the choosing a structure to be analyzed and to develop a tropical analysis. The researcher chose this site primarily due to its accessibility and location. Since the researcher resides near the site, feasibility of site inspection and structural analysis will be more convenient. Moreover, to promote research authenticity by analyzing different types of buildings aside from what was commonly chosen by other researchers.

II. Objective/s of the Project/Study

At the end of this narrative report, the researcher shall:

1. Define and identify the influence of climatic elements:
    a. Macro-climate
    b. Micro-climate
2. Define and identify the effects of the following climatic factors into the chosen building's climatic responsiveness:
    a. Site and Topography
    b. Building Orientation
    c. Materials
    d. Surrounding Elements
    e. Vegetation

III. Methodology

Methodology, in research, refers to the detailed description of data, procedures, tests, techniques, assessments, and research design to be used by a researcher to satisfy the research questions or objectives. (Mario, 2021)

A. Research Design

Research design refers to the strategy of gathering and analyzing data. (McCombes, 2021) In this narrative report, the research will be using a true experimental design. Define as a quantitative research design that aims to identify the cause and effect of the dependent variable while the independent variable is being manipulated. (Sreekumar, 2025)

In this narrative report, the independent variables shall be the climatic factors influencing the existence of the Our Lady of Mount Carmel Parish Church such as the following:

1. *Site and Topography:* the base of the building or structure. Its elemental components and profile determine its capability to handle the building or structure's foundation and prevent form collapsing or landscape deformation.
2. *Building Orientation:* the orientation of façades, elevations, interior spaces, and setbacks considering the sun path, prevailing winds, and building codes.
3. *Materials:* whether abundant or imported materials used in the building construction that complies with the climatic influences present in the area.
4. *Surrounding Elements:* structures or buildings nearby the site contribute to the shading, landscape, and building orientation of the chosen building.
5. *Vegetation:* plants and trees present on the site that contributes to the air quality and passive cooling mechanism inside and outside the building or structure.

The dependent variables, on the other hand, shall be the micro-climate of the chosen building. In the development of this tropical analysis, the independent variables will be based on current condition of the chosen building and its site, in order to observe the climate specific to the building.

B. Conceptual Framework

Aligned with the project objectives, a conceptual framework represents the relation of variables using the research process/es to be implemented to address each objective. (Swaen & Tegan, 2022)

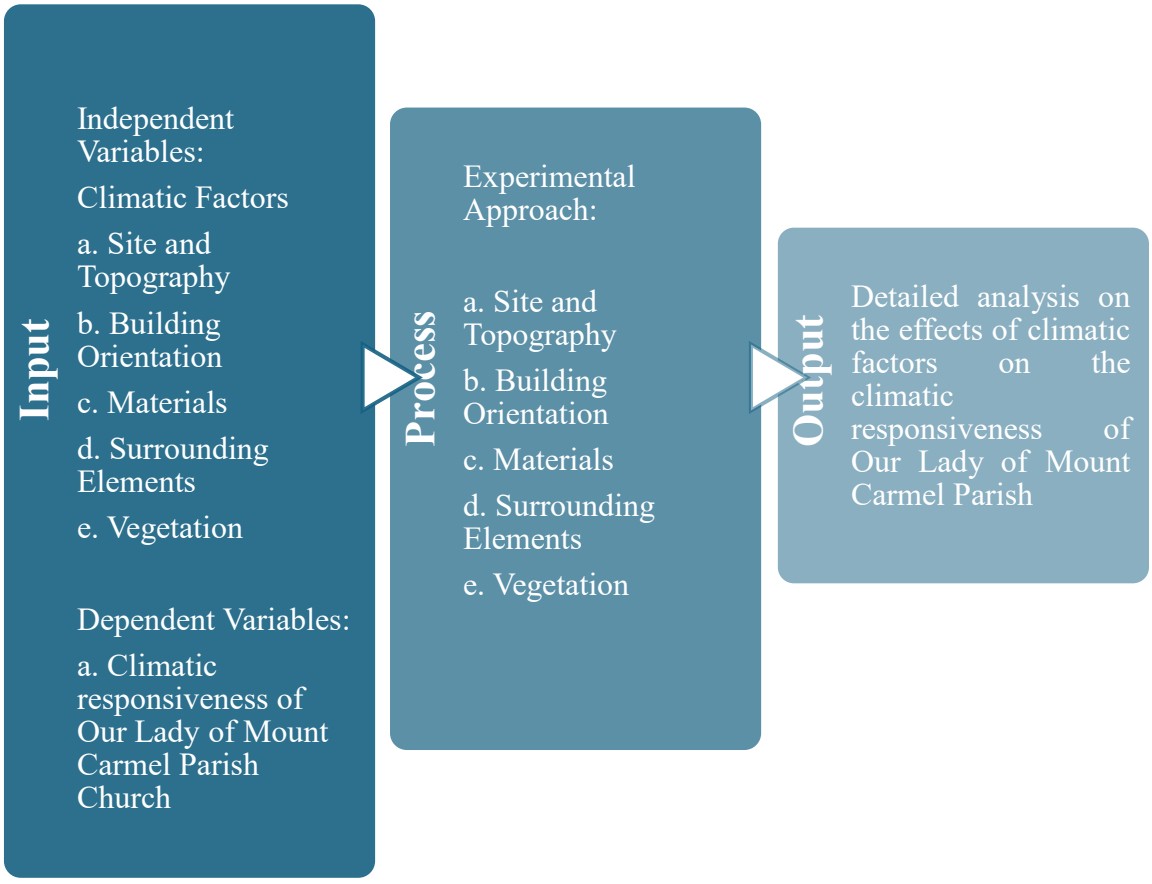


Figure 4: Conceptual Framework

According to Figure 4, conceptual framework follows an Input-Process-Output (IPO) format as experimental research design suggests. In the input, the researcher defines the independent and dependent variables. Whereas the process to be implemented to assess the variables is the research design: experimental approach. Then lastly, the expected output categorizes the effects of manipulating the independent variables to the dependent variables in terms of addressing the project objectives.

C. Theoretical Framework

Defined as a set of theories that further support a research. This overview of theories helps explain technical concepts in a study. (Lib Guides, n. d.)

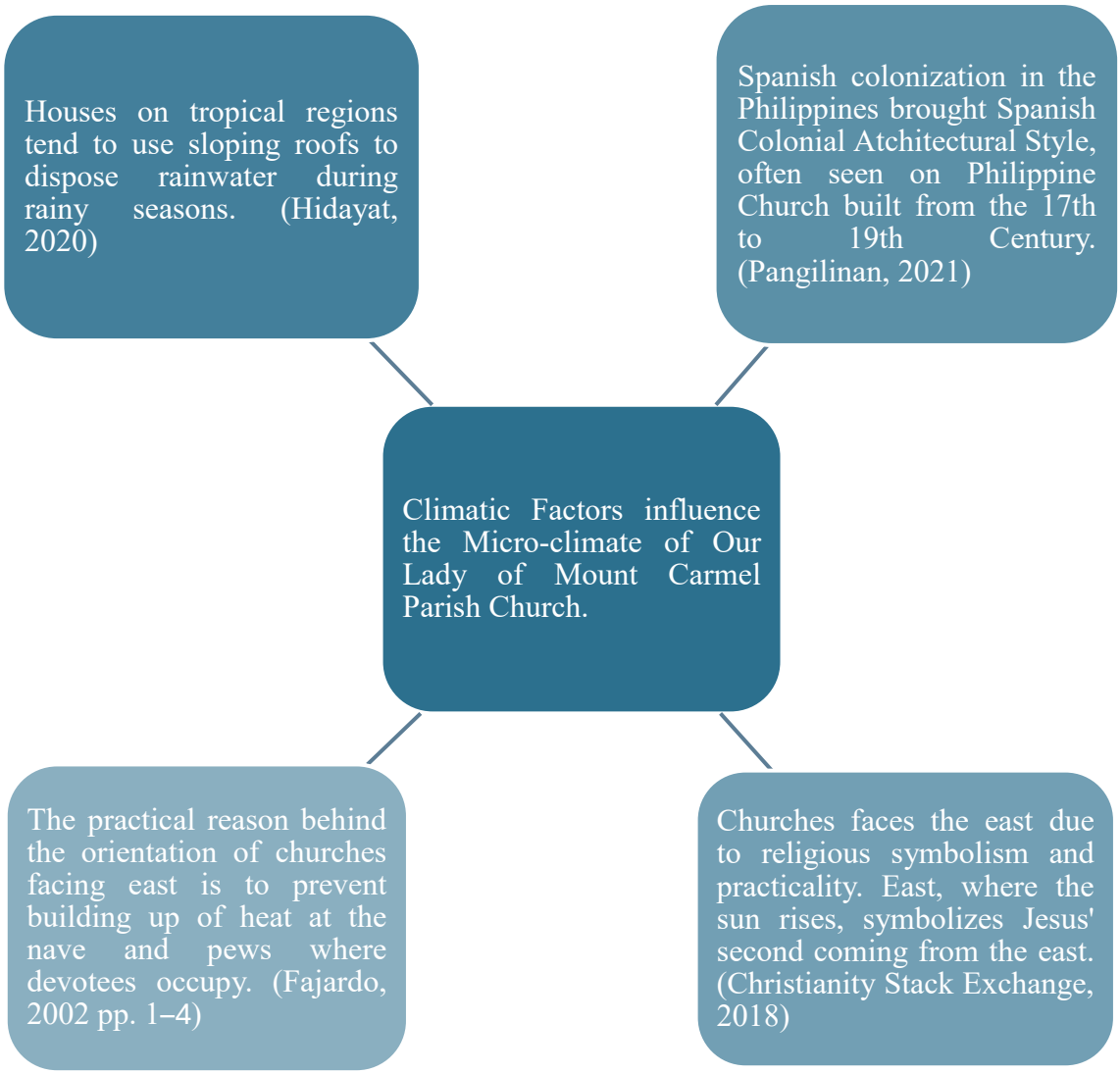


Figure 5: Theoretical Framework

Shown in Figure 5, four theories supplement the relation of climatic factors such as climate and site topography to the development of architectural elements of the Our Lady of Mount Carmel Parish Church. Hidayat (2020) and Pangilinan's (2021) theory refers to the influence of climatic, geographic, and historical factors in vernacular architecture. Whereas Fajardo (pp. 1–4, 2002) and the Christianity Stack Exchange (2018) theory merely refer to the cultural and religious considerations needed in planning and designing church buildings.

IV. Presentation of Findings

In order to develop a tropical analysis on the chosen structure: Our Lady of Mount Carmel Parish Church in terms of its climatic responsiveness, the researcher must first define the concepts of tropical design: climate, and its elements such as macro and micro-climate.

Firstly, climate refers to the long-term average weather pattern in a particular area. Since weather changes as abrupt as in a span of minutes, weather observance and tracking take a period of 30 years for it to be considered as an area's climate. These two elements vary on scale in order to project a climate classification on particular regions of the world. Thus, macro-climate refers to the classification of climate of a region on a scale of above 1:100 kilometers. Whereas micro-climate scopes a smaller perspective within 1:1 kilometer scale. (Zhang, et. al., 2022) In other words, micro-climate refers to the climatic condition of a particular site, building, or structure.

Considering local climatic factors, micro-climate can be determined by identifying and understanding each of the climatic factors.

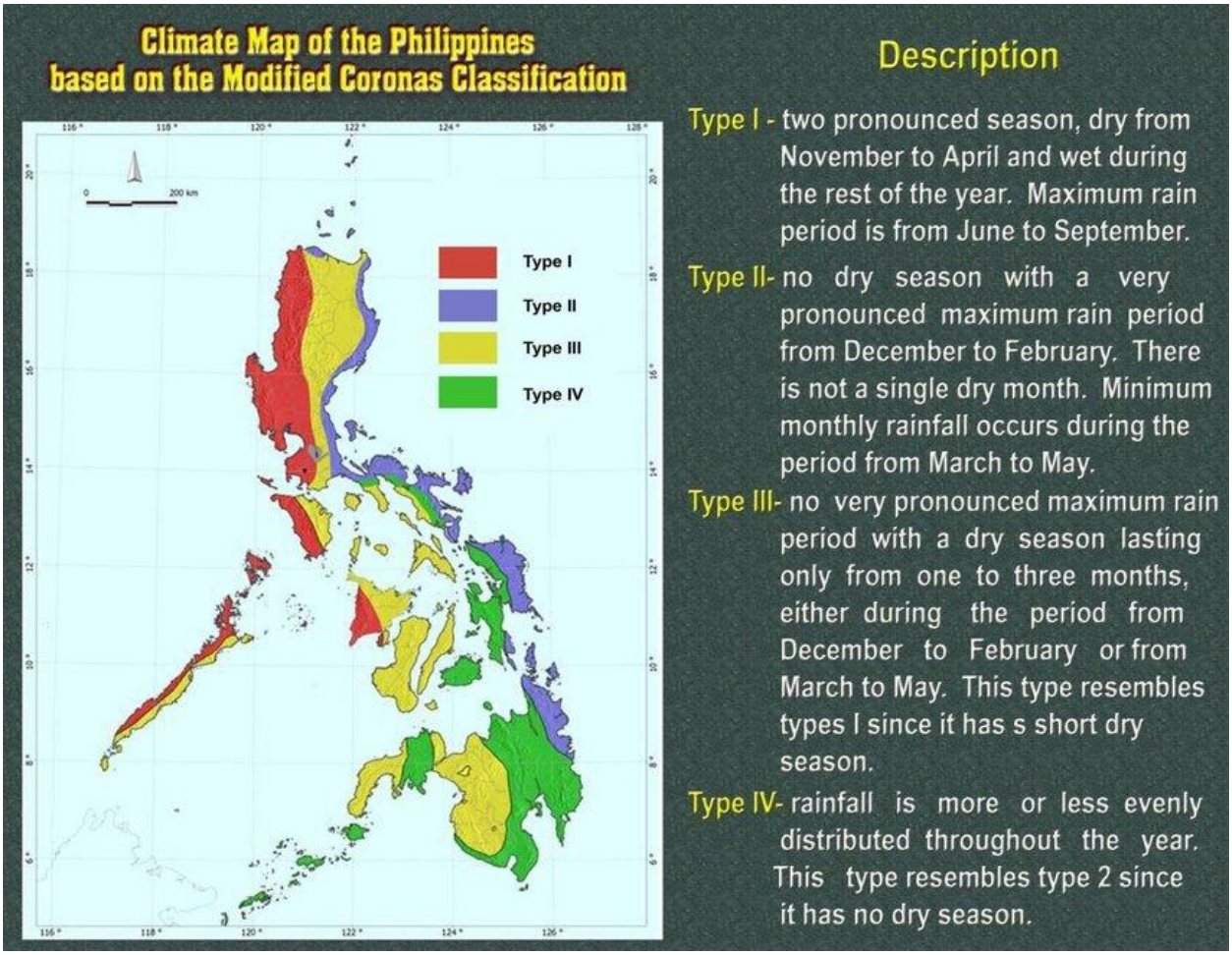


Figure 6: Climate of the Philippines; retrieved, 2 October 2025 at *https://www.researchgate.net/figure/Climate-map-of-the-Philippines-kidlatpagasadostgovph-cab-climatehtm_fig2_344583853*

Figure 6 shows the tropical climate classification projection in the Philippines at 1:200 kilometers scale. According to the figure, the province of Albay (Legazpi City at 13.1° N, 123.6° E) experiences three different types of tropical climate such as Types II, III, and IV. To narrow down to the specific data needed, the researcher projected another macro-climate map by scaling down the data present in Figure 6 to scale less than 1:100 kilometers showing the specific cities and municipalities that experiences each of the three types of tropical climate.

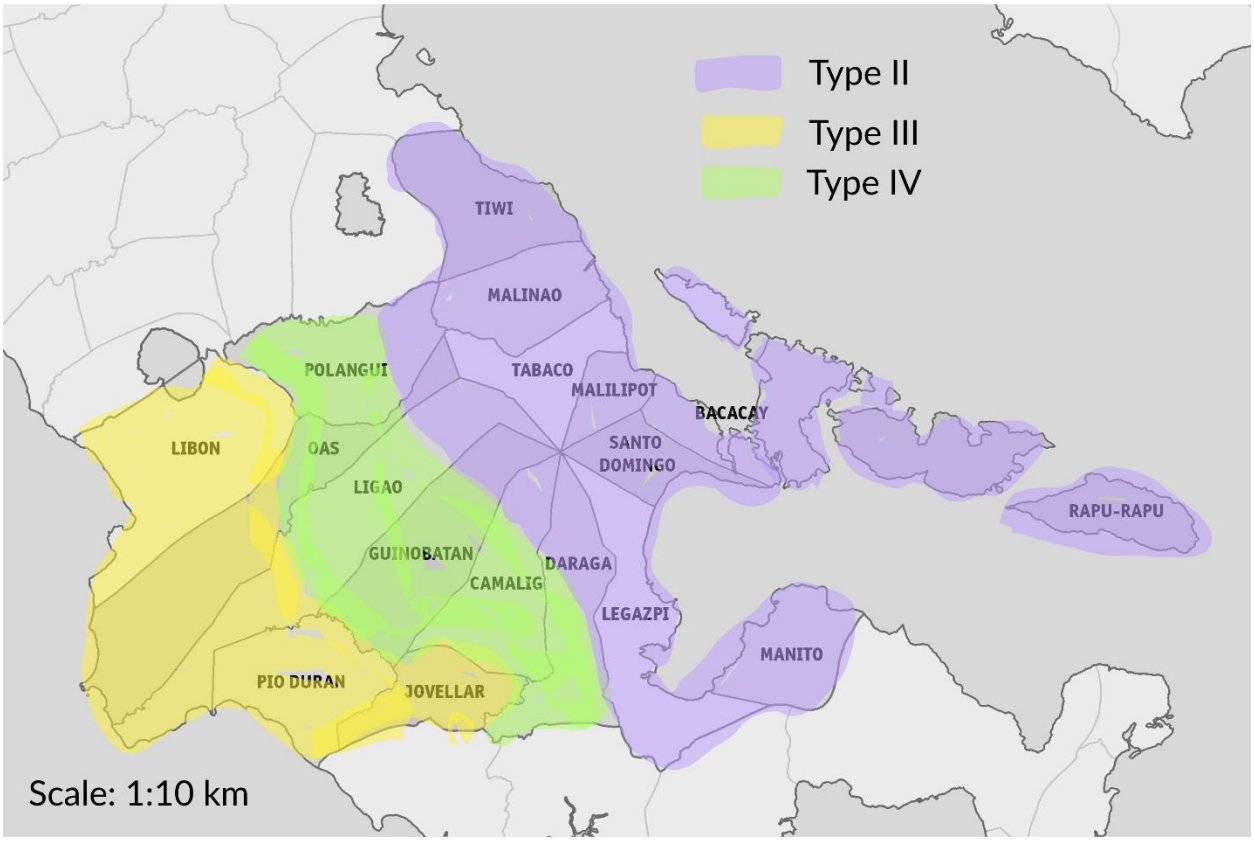


Figure 7: Macro-climate map of Albay Province based from the Macro-climate map of the Philippines in Figure 6; retrieved, 2 October 2025 from *https://commons.wikimedia.org/wiki/File:Ph_fil_albay.png*; edited by the researcher, 2 October 2025.

Thus, Figure 7 shows the scaled down macro-climate map of Albay province with data based on Figure 6. The municipality of Malilipot (13.3° N, 123.6° E) where the Our Lady of Mount Carmel Parish Church is situated, is categorized under Type II tropical climate. Going back to Figure 6, regions under Type II tropical climate experiences a no dry season with very high precipitation in months December to February. (Beroya-Eitner, 2014)

Further narrowing down to 1:100 meters scale, Figure 8 is the micro-climate map projection of the specific site of the parish church in Del Carmen Street, Barangay II (Poblacion), Malilipot, Albay highlighting the Type II tropical climate.

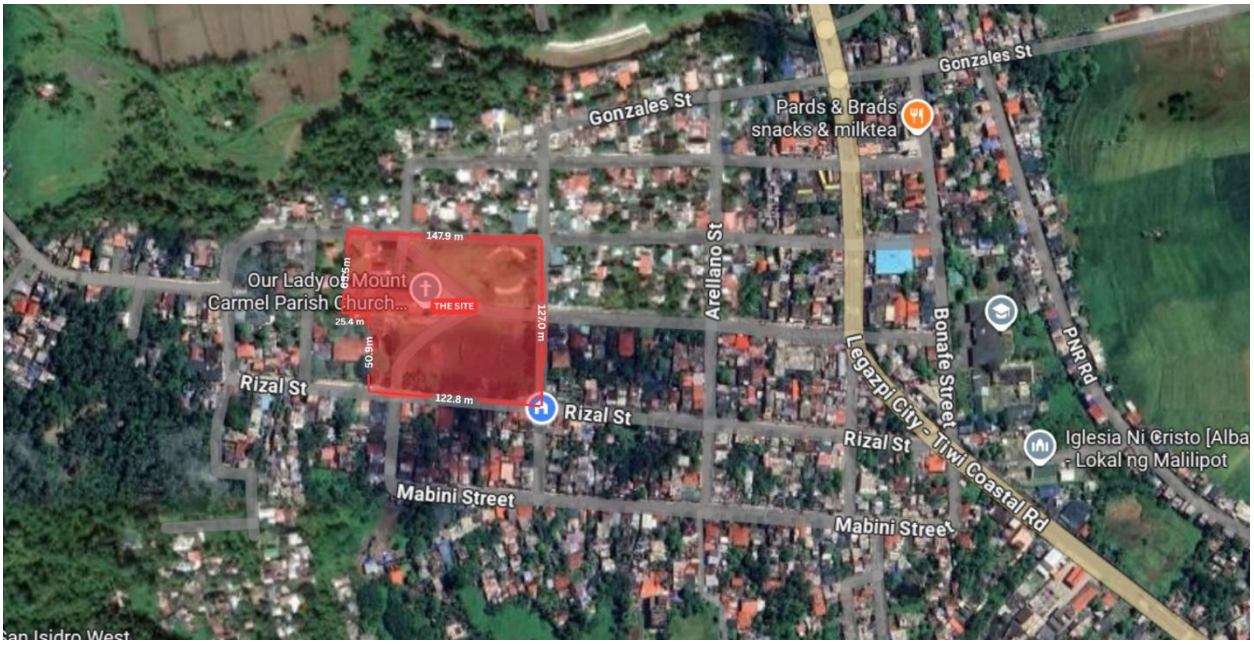


Figure 8: Site of Our Lady of Mount Carmel Parish Church to reference with climate classification maps; retrieved, 2 October 2025 from *Google Maps (Our Lady of Mount Carmel Parish Church, Malilipot, Albay)*; edited by the researcher, 2 November 2025.

A. The Climatic Factors

1. Site and Topography

The site is located in the central village (Poblacion) of the town of Malilipot making the Our Lady of Mount Carmel Parish as one of the continental churches of the province.

The site has an approximate total area of 17,600 meters^2 according to the measurements gathered. Whereas the existing church has an approximate area of 1,200 meters^2 (60 meters × 20 meters), utilizing about 6.8% of the lot area.

While several elements occupy the rest of the lot area (which will be discussed later in section A4), the researcher concludes that these elements do not significantly contribute to the heat factors of the church proper caused by Urban Heat Island (UHI) as most of them are placed in further distances having less effects of Urban Heat Island (UHI) from it. (Sarah, 2025) Although the Pea Chapel is located 2.1 meters South from the south wall of the church which is the least distance. (See Figure 9, Table 1)

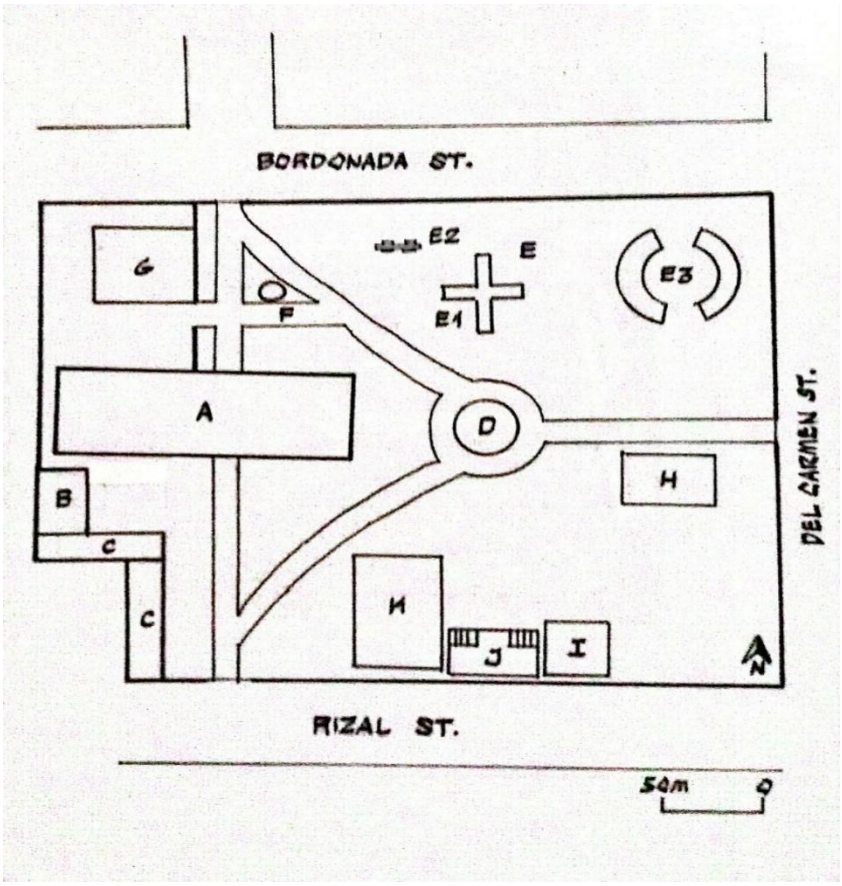


Figure 9: Schematic drawing of the site according to Figure 8; drawn by the researcher, 2 November 2025

Legend for Figure 9:
A. Church
B. Pea Chapel
C. 4-tier Sepulcher
D. Roundabout Statue of Jesus Christ
E. Playground Area
E1. 3-slope Slide
E2. 2-seater Swing
E3. Curved Walkway
F. Bronze Statue of St. Michael Archangel
G. Our Lady of Mount Carmel Parish Office
H. Volleyball Court
I. Tower of *Alleluia*
J. Stage
K. Basketball Court

Topography refers to the elevation of the site with respect to the sea level. According to Figure 10, the site is elevated ranging from 11 to 19 meters above sea level.

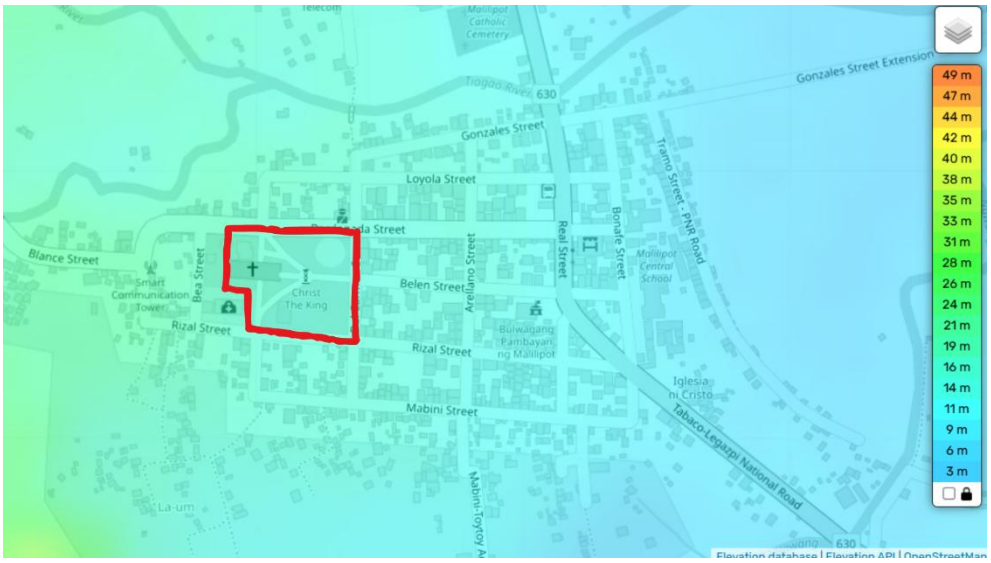


Figure 10: Topographical Map scaled down to the site; retrieved, 2 November 2025 from *https://en-gb.topographic-map.com/*; edited by the researcher, 2 November 2025.

In relation with climate, topography plays a significant role affecting the climate of a particular area. As topographical features such as mountains serves as a barrier for rains and clouds, when a raincloud passes through a mountain, the windward portion will receive most of its precipitation thus having slightly lower temperatures. On the other hand, the leeward portion will receive lesser precipitation than windward sometimes being the rain shadow or the area completely covered by the mountain from the precipitation.

To determine which is leeward and windward, refer to the nearest body of water and notable mountain. The warm and moist air from the body of water will be the origin point of air moving onshore. (Bacason, n. d.) (See Figure 11)

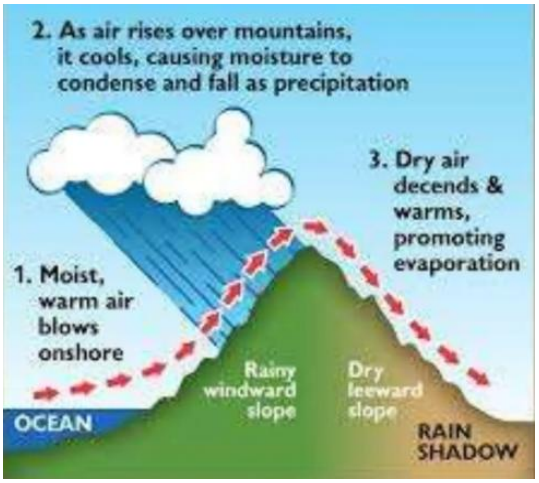


Figure 11: Precipitation on leeward and windward slopes; retrieved 2 November 2025 from *https://www.slideshare.net/slideshow/science-9-quarter-3-lesson-10-explain-how-topography-affects-climate/267860659*

Incorporating this principle with the actual site, the nearest body of water is the Philippine Sea, 1.03 kilometers away, and the Mount Bulakawan, still within Malilipot, 1.83 kilometers away. (See Figure 12) From the Philippine Sea, warm moist air is blown on shore to the windward slope. According to Figure 12, the site is located at the windward slope with respect to Mount Bulakawan, the site must receive lower temperatures during rainstorms and wet seasons.

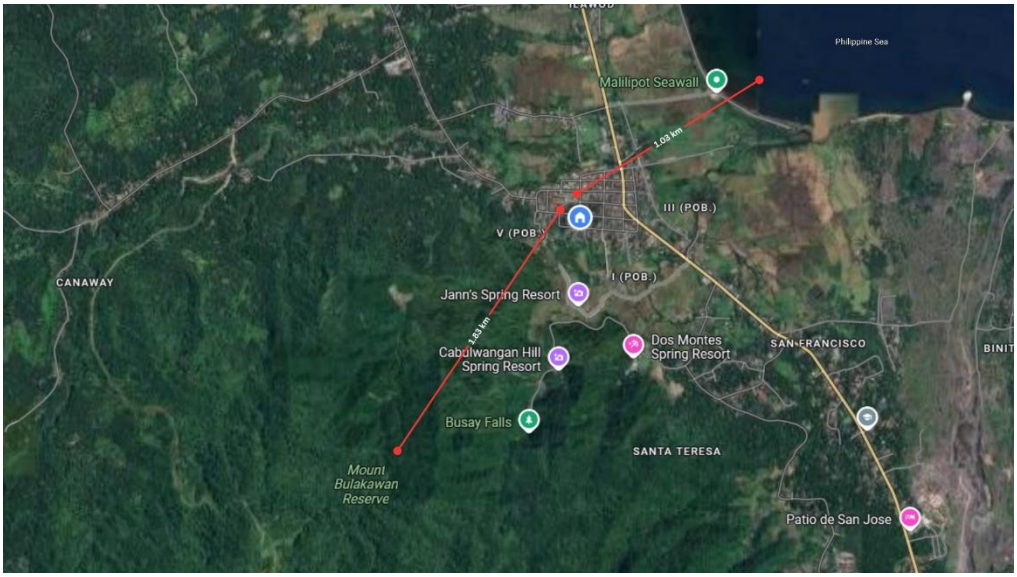


Figure 12: Scaled Map of Malilipot with respect to the nearest body of water and mountain; retrieved, 2 November 2025 from *Google Maps*; edited by the researcher, 2 November 2025.

2. Building Orientation

Referring to Figures 4 and 9, the church façade is facing east. (See Figure 9) This orientation is ground by historical, traditional, and logical considerations. For historical and traditional context, referring to the theoretical framework in Figure 4, architects tend to orient churches facing east to follow the saying in the Bible regarding the second coming of Jesus which is symbolized by the rising sun, which occurs at the east.

In the context of external factors, rooms placed due east tend to have lower temperature during nighttime. (Fajardo, 2002, pp. 1–4; See Figure 4) In a typical church plan, the porch, nave and aisle are parts usually placed at the east. It is done to prevent the build-up of heat during the late afternoon and evening since these parts are occupied mostly by visitors and devotees. Considering also that Sunday masses are held in the morning and afternoon.

Similarly, the building, Our Lady of Mount Carmel Parish Church follows all these principles. Shown in Figures 13 and 14 is a site analysis of the chosen building to further elaborate.

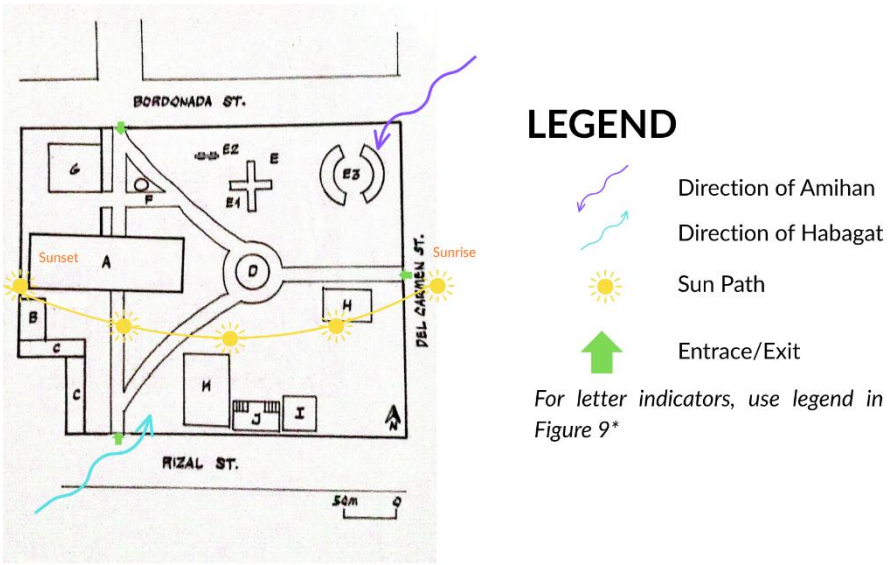


Figure 13: Site Analysis, Our Lady of Mount Carmel Parish Church, based from Figure 9; edited by the researcher, 2 November 2025.

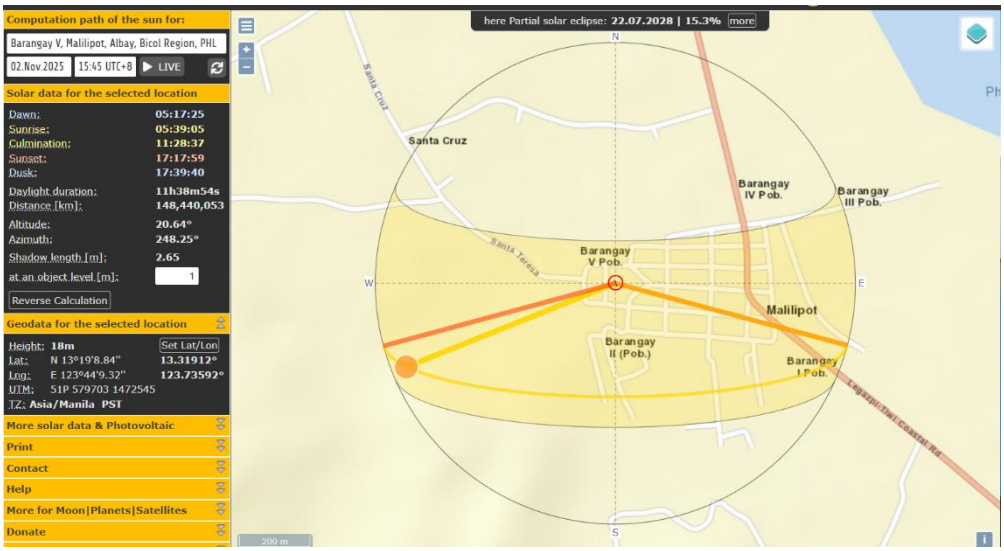


Figure 14: Sun Path reference for Figure 13; retrieved, 2 November 2025 from *https://www.suncalc.org/*

3. Materials

This climatic factor will be subdivided into two categories: walls and roofs. For walls, the chosen building, Our Lady of Mount Carmel Parish Church, uses volcanic stone brick masonry taken from the nearby Mayon Volcano. (Silver Backpacker, 2022) The utilization of these material for construction promotes thermal conductivity and rereleases passive cooling inside the building. (Cao, 2025)

Moreover, for the fenestration, stained windows are must-haves for this type of structures. These translucent glass windows help evenly diffuse light as it

enters, preventing overwhelming amount of sunlight inside the church and contributing to the overall aesthetics. (See Figure 15)

For the roofing, the church uses a gable type roofing, supported by corbelled, butterfly hinges. These elements highlight the continental church's impressive workmanship. (See Figure 16) Moreover, the use of gable type roofing helps effectively eliminate rainwater through its moderately pitched placement.

Figure 15: South Façade of the Church showing the arched South Entrance and the arched window with stained glass; taken by the researcher, 3 November 2025.

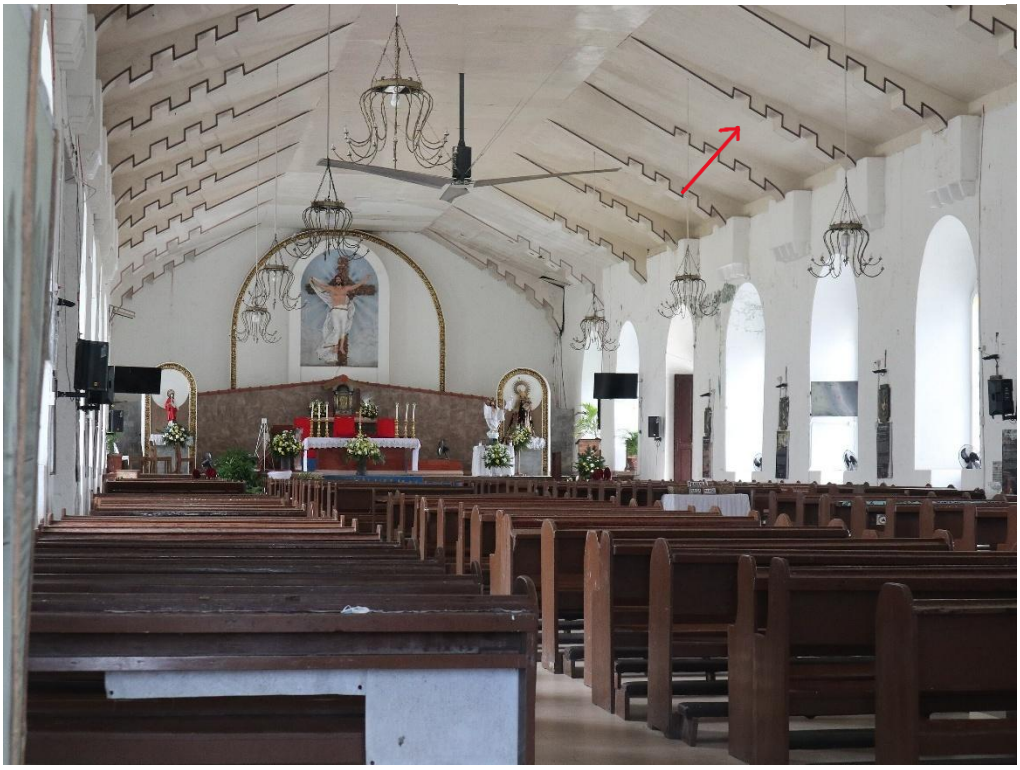


Figure 16: Interior view of the church from the left aisle, facing Northwest; taken, 18 April 2023; retrieved, 2 November 2025 from

https://commons.wikimedia.org/wiki/File:Our_Lady_of_Mount_Carmel_Church_Malilipot_inside_%28Del_Carmen,_Malilipot,_Albay;_04-18-2023%29.jpg

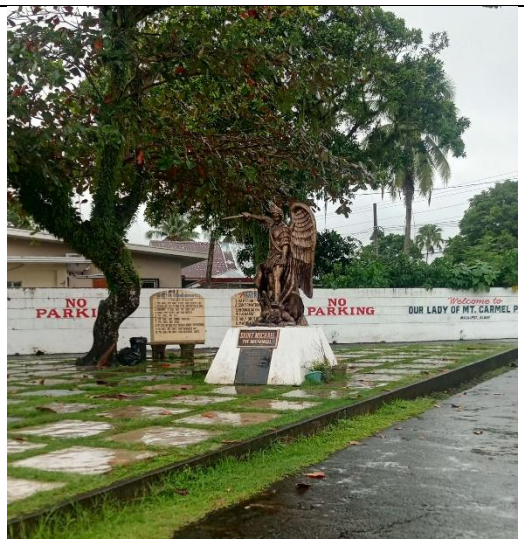
4. Surrounding Elements

Focusing on the church proper structure, stated back in Section A1, the site, aside from the church, has several elements surrounding the main subject as enlisted in the legend for Figure 9. These elements contribute to the micro-climate of the chosen building through its proximity with respect to it, contributing to the area's Urban Heat Island (UHI) condition.

To reiterate, tabulating these on-site elements, the Pea Chapel is the nearest thus contributes the most to the Urban Heat Island (UHI) condition of the church. (See Table 1)

Name of Existing Structure	Actual Picture	Displacement from the Church (meters)
Pea Chapel	**Figure 17:** The Pea Chapel Façade with some of the 4-tier sepulcher; taken by the researcher, 3 November 2025.	2.1
4-tier Sepulcher	**Figure 18:** The rest of the 4-tier sepulcher with the statue of Mary, taken by the researcher, 3 November 2025.	17.7

Roundabout Statue of Jesus Christ	 **Figure 19:** Statue of Jesus Christ situated on a roundabout in front of the Church; taken by the researcher, 3 November 2025.	24.5
3-slope Slide	 **Figure 20:** The 3-slope Slide; taken by the researcher, 3 November 2025.	34.1
2-seater Swing	 **Figure 21:** The now-unusable 2-seater swing beside the 3-slope Slide; taken by the researcher, 3 November 2025.	45.1

Curved Walkway	**Figure 22:** The curved walkway; taken by the researcher, 3 November 2025.	59.4
Bronze Statue of St. Michael Archangel	 **Figure 23:** The bronze statue of St. Michael Archangel; taken by the researcher, 3 November 2025.	15.2
Parish Office	**Figure 24:** The Parish Office located North from the North Entrance of the Church; taken by the researcher, 3 November 2025.	4.7

Volleyball Court	**Figure 25:** The site of the now-demolished volleyball court; taken by the researcher, 3 November 2025.	51.2
Tower of *Alleluia*	**Figure 26:** The Tower of *Alleluia*; taken by the researcher, 3 November 2025.	67.3
Stage	**Figure 27:** Site of the now-demolished stage of Easter Vigil ceremony; taken by the researcher, 3 November 2025.	73.0

Basketball Court	**Figure 28:** The basketball court; taken by the researcher, 3 November 2025.	28.7

Table 1: Proximity table of surrounding on-site existing elements with respect to the church proper structure.

Scaling down to the surrounding elements of the site, Figure 29 shows the types of complex that surrounds the site. It shows that the parish church is surrounded by mostly residential buildings. On the west side, a Rural Health Unit (RHU) is situated. Which again, these elements contribute to the Urban Heat Island (UHI) condition of the church.

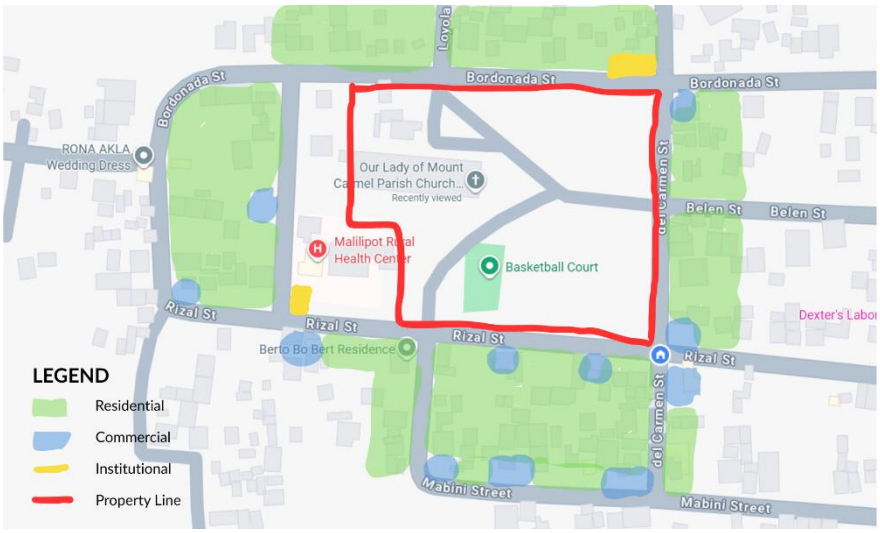


Figure 29: Economic Projection Map of Surrounding Existing Elements around the site; retrieved, 2 November 2025 from *Google Maps*; edited by the researcher, 2 November 2025.

5. Vegetation

Plants and trees, as they positively contribute to humans, are also beneficial for maintaining natural passive cooling effects around a building. Integrating in the manner of architecture, these natural shade and clean air providers are logically and aesthetically arranged to form an influential space.

Shown in Figure 30 is a present development of the site with trees, plants, and flowers. Notice also that about 60% of the free space on the site is covered with grass under maintenance of the Parish Office. This implies that the site—all its elements—are well-influenced by these vegetations present, allowing effective passive cooling mechanisms and an influential aesthetic in landscaping.

Figure 30: Site Development Map showing Vegetation on and near the site; retrieved, 2 November 2025; edited by the researcher, 2 November 2025.

To conclude, investigating these following climatic factors does not only aim to understand the present conditions of the church and the parish as a whole, but also tests its climatic responsiveness: its future capability of accommodating visitors and devotees aided by both artificial and natural passive cooling mechanisms as climate in the region continues to change.

V. Conclusion and Recommendation(s)

This section concludes the results of the tropical analysis specifically the effects of climatic factors to the climatic responsiveness of the chosen building: Our Lady of Mount Carmel Parish Church.

A. Conclusion

After analyzing the effects of climatic factors to the church's climatic responsiveness, the researcher concludes that the chosen building embodies a climatic responsive approach with respect to its local climate. To elaborate, the following is a breakdown of the results:

Land use efficiency refers to the strategic usage of the given lot area of the site. This approach was applied in the chosen building thus promoting the preservation of the existing natural elements such as trees which are helpful for regulating the climate in the area. (Bettersworth & Associates, Inc., 2024)

The concept of leeward and windward slopes also contributed to the fast growth of vegetation which again is crucial in regulating the local climate, provide shading, and promotes broader passive cooling areas.

Most importantly, the consideration of sun path and prevailing winds with respect to the resulting building orientation is seen as the most crucial parts of the building (nave and aisles) are logically placed to address climatic concerns at specific times of the day.

To wrap up, buildings such as churches should crucially consider these climatic factors in order to thoroughly plan its climatic responsive design. As to embody a perennial institution, developing this approach in designing these structures would significantly help the preservation not just the architectural character, but also its physical capability to withstand the effects of the changing climate in the area.

B. Recommendation(s)

Considering that the chosen structure holds a perennial character in the municipality, and minimal concerns regarding the effects of the climatic factors to the building's climatic responsiveness were found, minimal renovations and retrofitting could be done.

First, in the materials used, in line with future renovations in the church façade, the researcher suggests the utilization of eco-friendly substitute for concrete such as "green-crete". In this way, it will reduce carbon dioxide emissions compared to the traditional concrete. Then, the addition and promotion of landscaping vegetation would not only improve the landscaping aesthetic but also promote regulation of climate.

VI. References

Bacason, M. G. (n.d.). *Science 9 Quarter 3 Lesson 10: Explain how topography affects climate.* Slideshare. Retrieved, 2 November 2025 at https://www.slideshare.net/slideshow/science-9-quarter-3-lesson-10-explain-how-topography-affects-climate/267860659

Beroya-Eitner, M. a. E. B. (2014, May). *Climate Map of the Philippines Based on the Modified Coronas Classificiation*. Research Gate. Retrieved, 2 October 2025 at https://www.researchgate.net/figure/Climate-map-of-the-Philippines-kidlatpagasadostgovph-cab-climatehtm_fig2_344583853

Cao, L. (2025, May 28). *What materials keep buildings cool?* ArchDaily. Retrieved, 2 November 2025 at https://www.archdaily.com/923445/what-materials-keep-buildings-cool

Earth How. (2023, September 27). *What are the 5 Koppen climate classification types?* Earth How. Retrieved, 23 September 2025 at https://earthhow.com/koppen-climate-classification/

Fajardo, M. F. (2002). *Planning and Designers Handbook* (2nd ed.). 1–4. 5138 Trading. Retrieved, 24 September 2025

Fiveable. (2024, August 1). climate responsiveness – Intro to Humanities. Retrieved, 5 November 2025 at https://fiveable.me/key-terms/introduction-humanities/climate-responsiveness

Fletcher, B. F. F. (1905). *A history of architecture on the comparative method* (5th ed.). London: Batsford. 11–12. Retrieved, 23 September 2025 at https://archive.org/details/historyofarchite00fletuoft/mode/2up

Hidayat, A. (2020, July 25). *Tropical architecture: the art of living in the tropics*. Indonesia Design. Retrieved, 24 September 2025 at https://indonesiadesign.com/story/tropical-architecture#:~:text=Most%20tropical%20houses%20also%20have,a%20glass%20facade%20cladding%20system.

Holder, H. (2023, April 17). *What is tropical architecture?* Architropics. Retrieved, 23 September 2025 at https://architropics.com/what-is-tropical-architecture/

LibGuides: Chapter 1: Theoretical framework. (n.d.). Retrieved, 24 September 2025 at https://resources.nu.edu/c.php?g=1006886&p=9620737

Mario, J. C. M. (2021). *Methodology Section for Research Papers*. San Jose University. Retrieved, 23 September 2025 at https://www.sjsu.edu/writingcenter/docs/handouts/Methodology.pdf

Maximizing land use efficiency: Strategies for Effective Development Planning. (2024, April 25). Bettersworth and Associates, Inc. Retrieved, 5 November 2025 at https://bettersworthandassociates.com/2024/04/maximizing-land-use-efficiency-strategies-for-effective-development-planning/#:~:text=Land%20use%20efficiency%20is%20a,economic%20development%2C%20and%20environmental%20preservation.

McCombes, S. M. (2021, June 7). *What is a research Design | Types, Guide & Examples* (P. B. Bhandari, Ed.). Scribbr. Retrieved, 24 September 2025 at https://www.scribbr.com/methodology/research-design/

Ona, A. E. O. (2025). *ATD1 Lecture Notes* [Slide show; Online Presentation Slides]. Retrieved, 2 October 2025 at https://classroom.google.com/c/NzgzNTAxMjQ5NzY5

Pangilinan, E. P. (2021). *Colonial and Post-Colonial architecture* [Slide show]. Interior Educators. Retrieved, 24 September 2025 at https://interioreducators.co.uk/uploads/submitted-files/149.W_.CS_.2021.c_.pdf

Sarah. (2025, April 2). *Urban Heat Islands (UHI) : Definition, Causes and Solutions for cities*. Siradel. Retrieved, 2 November 2025 at https://www.siradel.com/urban-heat-island-effect-causes-and-solutions/

Silver Backpacker. (2022, November 13). *Albay Churches to visit for seasonal pilgrimages Pt.1*. Retrieved, 23 September 2025 at silverbackpacker.com. https://silverbackpacker.com/albay-churches-bicol-philippines/

Sreekumar, D. (2025, July 23). *What is Experimental Research Design? Definition, Types, and Examples | Researcher.Life*. Retrieved, 24 September 2025 at https://researcher.life/blog/article/what-is-experimental-research-design-definition-examples-types/

Swaen, B. S., & Tegan, G. T. (2022, August 2). *What is a conceptual framework? | Tips & examples*. Scribbr. Retrieved, 24 September 2025 at https://www.scribbr.com/methodology/conceptual-framework/

Why do many old churches face east? (2018, March 15). Christianity Stack Exchange. Retrieved, 24 September 2025 at https://christianity.stackexchange.com/questions/62632/why-do-many-old-churches-face-east#:~:text=And%20since%20the%20dawn%20is,sacrifice%2C%E2%80%9D%20say%20the%20Psalms.

Zhang, J. Z., Zhang, F. Z., Gou, Z. G., & Liu, J. L. (2022, March). *Assessment of macroclimate and microclimate effects on outdoor thermal comfort via artificial neural network models.* Science Direct. Retrieved, 2 October 2025 at https://doi.org/10.1016/j.uclim.2022.101134

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VIII. Evaluation Mechanics

Activity/Output Scorecard							
			Status				
			Outstanding	Superior	Very Satisfactory	Satisfactory	Fair
			95–100	89–94	85–88	80–84	75–79
Code	**Mechanics**	**Description**	1.4–1.0	2.0–1.5	2.4–2.1	2.7–2.5	3.0–2.8
C	Content of Report	○ Refers to the impact/bearing and discussion of report.					
P	Preparation and organization style	○ Refers to the layout, presentation style, and content organization; and ○ Proper citations of literature, if any.					
I	Illustrations	○ Refers to the proper illustration such as sketches, drawings, images, or the like; ○ Proper labeling of tables, figures, and/or graphs, if any; and ○ Proper citation of sources, if any.					
T	Timeliness	○ Refers to the observance and compliance according to submission schedule.					
		Average					

BICOL UNIVERSITY GRADING SYSTEM

RATING	STATUS	INDICATORS
99-100 – **1.0**	Outstanding	Demonstrated and complied with *highest performance* according to subject and objective.
98 – **1.1**		
97 – **1.2**		
96 – **1.3**		
95 – **1.4**		
94 – **1.5**	Superior	Demonstrated and complied with *very high performance* according to subject and objective.
93 – **1.6**		
92 – **1.7**		
91 – **1.8**		
90 – **1.9**		
89 – **2.0**		
88 – **2.1**	Very Satisfactory	Demonstrated and complied with *high performance* according to subject and objective.
87 – **2.2**		
86 – **2.3**		
85 – **2.4**		
84 – **2.5**	Satisfactory	Demonstrated and complied with *average performance* according to subject and objective.
82-83 – **2.6**		
80-81 – **2.7**		
78-79 – **2.8**	Fair	Demonstrated and complied *fairly* according to subject and objective.
76-77 – **2.9**		
75 – **3.0**		
3.1 – 4.0	Conditional Failure (Lowest Possible Midterm Rating)	Subject for make-up.
5.0	Failure	Failed
INC	Incomplete	For compliance

Nothing Follows